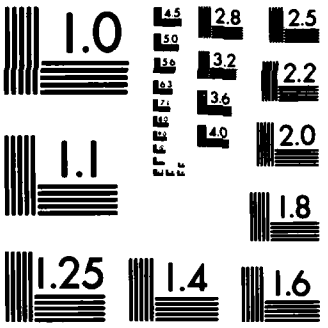
AD-A130 602 LASSA FEVER IMMUNE PLASMA(U) COLUMBIA UNIV NEW YORK DIV OF TROPICAL MEDICINE J D FRAME AUG 80 DAMD17-79-C-9024 1/1

UNCLASSIFIED F/G 6/5 NL



AD_____

(1)

REPORT NO. 2

LASSA FEVER IMMUNE PLASMA

Annual Summary Report

John D. Frame, M.D.
Division of Tropical Medicine
School of Public Health, College
of Physicians and Surgeons
Columbia University

August, 1980

Supported by

U.S. ARMY MEDICAL RESEARCH AND DEVELOPMENT COMMAND
Fort Detrick, Frederick, Maryland 21701

Contract No. DAMD-17-79-C-9024

Trustees of Columbia University
in the City of New York
New York, N.Y. 10032

Approved for public release; distribution unlimited

The findings of this report are not to be construed as an official Department of the Army position unless so designated by other authorized documents.

SECURITY CLASSIFICATION OF THIS PAGE (When Data Entered)

REPORT DOCUMENTATION PAGE		READ INSTRUCTIONS BEFORE COMPLETING FORM
1. REPORT NUMBER	2. GOVT ACCESSION NO. AD-A130602	3. RECIPIENT'S CATALOG NUMBER
4. TITLE (and Subtitle) Lassa Fever Immune Plasma		5. TYPE OF REPORT & PERIOD COVERED Annual (1 Aug 79 to 31 July 80)
		6. PERFORMING ORG. REPORT NUMBER
7. AUTHOR(s) John D. Frame, M.D.		8. CONTRACT OR GRANT NUMBER(s) DAMD 17-79-C-9024
9. PERFORMING ORGANIZATION NAME AND ADDRESS Division of Tropical Medicine Columbia University New York, New York 10032		10. PROGRAM ELEMENT, PROJECT, TASK AREA & WORK UNIT NUMBERS 62776A.3M162776A841.00.089
11. CONTROLLING OFFICE NAME AND ADDRESS US Army Medical Research and Development Command Fort Detrick, Frederick, MD 21701		12. REPORT DATE August 1980
		13. NUMBER OF PAGES 16
14. MONITORING AGENCY NAME & ADDRESS(if different from Controlling Office)		15. SECURITY CLASS. (of this report) Unclassified
		15a. DECLASSIFICATION/DOWNGRADING SCHEDULE

16. DISTRIBUTION STATEMENT (of this Report)

Approved for public release; distribution unlimited

17. DISTRIBUTION STATEMENT (of the abstract entered in Block 20, if different from Report)

18. SUPPLEMENTARY NOTES

19. KEY WORDS (Continue on reverse side if necessary and identify by block number)

Lassa Fever
Lassa virus
Immune plasma
Fluorescent antibodies
Liberia

20. ABSTRACT (Continue on reverse side if necessary and identify by block number)

A program for the collection of Lassa fever immune plasma in Liberia for the U.S. Army Medical Institute of Infectious Diseases continues. Columbia University in collaboration with the Liberian Institute for Biomedical Research (LIBR) has established a serological laboratory at the LIBR and a Liberian has been trained in the techniques of serological testing and in the conduct of field investigations. Surveys of hospital staffs and villages for the prevalence and incidence of Lassa virus infections continue. Equipment for

DD FORM 1 JAN 73 1473 EDITION OF 1 NOV 65 IS OBSOLETE

SECURITY CLASSIFICATION OF THIS PAGE (When Data Entered)

plasmapheresis has been put in place in the field, and will be used for collection of units of Lassa fever immune plasma.

TABLE OF CONTENTS

	Page
Summary	2
Statement of the problem	4
Background	4
Approach to the problem	4
Results	4
Conclusion	8
References	9
Tables	
1. Serological survey of hospital staff members at the Swedish Free Penetecostal Mission Clinic.	10
2. Serological survey of hospital staff members at the Curran Lutheran Hospital.	10
3. Serological testing of patients with fever, Curran Lutheran Hospital.	11
4. Clinical notes regarding patients with fever, positive for Lassa virus antibodies.	11
Maps	
Liberia	12
Zor Zor Health District	13
Appendix - Comments in recent political changes in Liberia and the Lassa Fever Immune Plasma program	14
Distribution	15

Statement of the Problem:

Investigations of Lassa fever, a recently discovered viral disease of West Africa are somewhat limited by the risk the disease poses to the investigator. The availability of immune plasma from convalescents from this infection would provide needed protection, as well as material to be used in the investigations proper.

Background:

Though the initial reports of Lassa fever (LF) indicated high case fatility rates (1,2,3), subsequent investigations have suggested that the disease is not as uniformly severe as the experience of the early nosocomial outbreaks indicated (4,5). Lassa virus (LV) infections are, however, widespread in West Africa (5,7).

Because of the apparent extensive distribution of LV infection and the potential risk to both patients and investigators, the U.S. Army Medical Research Institute of Infectious Diseases (USAMRIID) entered into a collaborative program with this institution for the procurement of LF immune plasma and Congo virus immune plasma, and the development of data regarding the prevalence and disease attack rates of LF in the area where the plasma was to be obtained. An ultimate goal is the development of vaccine for protection against LF.

Approach to the Problem

Following preliminary investigations in Liberia it was decided to concentrate in the investigations in that country. To this end collaborative arrangments have been made with the Liberian Institute for Biomedical Research (LIBR), Dr. Emmet A. Dennis, Director. An agreement, embodied in a subcontract with the LIBR, includes the recruiting of a staff consisting of Field Investigator and Field Assistant in Liberia, surveys of selected villages and hospital personnel, monitoring of patients hospitalized with fever, the development within Liberia of the capacity to conduct serological testing, and the procuring of LF immune plasma from convalescents.

The approach to the problem is described in greater detail in the first Annual Report.

Results:

A. Narrative

The subcontract with the LIBR was completed late in the first year of the project, and concurrently, a subcontract was made with the New York Blood Center (NYBC) for the training of Liberian personnel in serological techniques. This was possible because of the presence at the LIBR of VILAB II, a field station of the NYBC, and professional personnel competent in serological testing.

In late 1979 a fluorescence microscope was set up at the LIBR, and first used for testing for LV antibodies. The equipment came to good use in November, 1979, when there was a case of suspected LF at the ELWA Mission Hospital in the outskirts of Monrovia. Tests done at the LIBR using appropriate antigen supplied by the USAMRIID suggested that the case was in fact one of LF, and that the hospital staff had indeed been exposed to infection from the dying woman. Intensive collaboration with the Lassa Fever Project in Sierra Leone, under the management of the United States Center for Disease Control (CDC), resulted in some questions as to the diagnosis. Though it was certain that the woman had LV antibodies, it was not certain whether they represented current or past infection. Testing of sera in parallel at USAMRIID and the CDC in Atlanta, Georgia, resulted in differences in the results. The USAMRIID studies tended to support the results of the tests at the LIBR, while those in Atlanta were in general parallel to the results in Kenema, Sierra Leone. Though the outcome of this discrepancy is not truly a part of the current project, discussions between the CDC and USAMRIID concluded that the USAMRIID techniques for inactivating virus was less destructive to antigenicity; its antigen was therefore more sensitive.

Attempts to test this conclusion by comparison of results of titrations of sera collected earlier, using both CDC and USAMRIID antigen, were inconclusive. A number of sera were "wasted" by the use of a batch of reagent that was of low antigenicity. However, it does appear that the use of USAMRIID antigen discovers about twice as many seropositive persons in a population as does the CDC antigen. Attempts to confirm this statistically have been frustrated by some differences in antigenicity from batch to batch of reagent, and by political developments in Liberia which will be described presently.

In October, 1979, and January, 1980, hospitals not previously incorporated in the study were visited in Montserrado and Cape Mount Counties. The Medical Directors of the B.F. Goodrich Hospital, the Mano River Mines Hospital and the Bomi Hills Government Hospital all indicated their desire to collaborate. The first two institutions have in fact carried out serum collection from their staffs, and the sera are being tested at the LIBR.

The Curran Lutheran Hospital (CLH) in ZorZor and the Swedish Free Pentecostal Mission Clinic in Foya Famara, both in Lofa County, were visited in October, 1979 and January, 1980. Serological specimens collected from the hospital staffs were picked up, and arrangements made for the regular testing of febrile patients in both institutions. On the second visit the patient specimens were collected and tested. The results of the tests done to date are reported below.

During these visits it was found that at CLH plasma units are collected as the "by-product" of packed red cell preparations for use in pediatric patients. If the plasma units are not used, they are eventually discarded because of the lack of space in the freezers for their storage. Aliquots of the plasma were tested by Dr. Jordi Casals of the Yale

Arbovirus Research Unit (YARU), the results are given below.

In March, 1980 Dr. Dennis employed the Field Investigator, Mr. J. E. Yalley-Ogunro, out of ten applicants responding to an advertisement for this position. Mr. Yalley-Ogunro graduated from the University of Liberia where he majored in Zoology. His family is of Ghanaian origin, and naturalized Liberian citizens. He has assisted in the business aspects of his father's pharmacy. Since his employment Mr. Yalley-Ogunro has been learning techniques of immunofluorescent antibody testing, has helped with administrative aspects of the project, and has visited the Mano River Mines and B.F. Goodrich Hospitals in connection with the staff surveys being conducted there.

In April, 1980 President William Tolbert of Liberia was assassinated in a coup. Though the previous Minister of Health, Dr. Kate Bryant, was retained in the new government, there was for a time some question about the status of Dr. Emmet Dennis who had been a protege of the previous administration. The political uncertainty frustrated the planned trip of the Principal Investigator to Liberia in April. However, in June it became clear that the LIBR and the hospitals were in a position to continue the program, and the Principal Investigator returned to Liberia in late July. His principal objective was the instruction of the Field Investigator in the setting up of the village surveys to be conducted with the cooperation of the Community Health Program of the Curran Lutheran Hospital in Lofa County. Observations of the Investigator, Mr. Yalley-Ogunro, showed him to be a deft and careful technician in the serological testing of specimens. He has made himself thoroughly familiar with the objectives and plan of action of the project. He has also studied the budget carefully, and demonstrates complete understanding of the fiscal aspects of the subcontract between Columbia University and the LIBR.

The leaders of the Community Health Program and the village leadership were enthusiastic in their support of the projected surveys which will be carried out immediately, and should be completed by mid-autumn, 1980. (see Appendix A.)

B. Experiments

1. Staff survey, Swedish Free Pentecostal Mission Clinic

A serological survey of the staff of the SFPMC at Foya Kamara, Lofa County, had been conducted in 1977, using the indirect fluorescent antibody technique (IFAT) with antigen supplied by the Center for Disease Control (CDC). At that time 23% of 35 African staff members were found to be seropositive.

In April, 1979 a serological survey was repeated, and specimens tested by Dr. Rinus van den Ende at the LIBR in December, 1979, and by Dr. Casals at the YARU in the spring of 1980. The antigen was supplied by the USAMRIID; different batches of antigen were used in the two laboratories. Dr. Casals used goat anti-human-globulin conjugate, and

Dr. van den Ende, rabbit anti-human-globulin conjugate. Some specimens were inadvertendly not supplied to Dr. Casals. Dr. van den Ende titered out all specimens to their end-points, or up to a dilution of 2:32, Dr. Casals screened 11 specimens at titers of 1:4, indicating the strength of the reaction at this titer; his limited supply of antigen did not permit complete titering out of the specimens. The results of the tests are given in Table 1.

The prevalence of seropositive specimens at this time, 40% at LIBR and 61% at YARU, is approximately twice what it was in 1977. This may indicate a recent outbreak of LF in the area. However, we believe it reflects increased sensitivity of the USAMRIID antigen over that from the CDC. This point will be clarified after further experiments.

This collection was the first tested at the LIBR and the first in which the results were compared with the tests at the YARU. Dr. van den Ende found a large number of nonspecific reactions which he ascribed to the conjugate he was using; in some instances the "nonspecific" reactions may have masked "specific" reactions.

Dr. van den Ende is retesting the specimens with conjugate goat anti-human-globulin conjugate.

2. Staff, Curran Lutheran Hospital

The 1977 serological survey of the staff of the Curran Lutheran Hospital, ZorZor, Lofa County, had resulted in a prevalance of 12% seropositivity. CDC antigen was used at this time.

In April 1979 sera were obtained from 89 staff members, with testing performed by Dr. van den Ende at the LIBR and Dr. Casals at YARU. As in the previous experiment, Dr. Casals tested specimens at a screening titer of 1:4, and Dr. van den Ende up to a titer of 1:32. The results are given in Table 2.

As in the previous experiment, the prevalences of seropositive specimens, 25% at the LIBR and 17% at YARU, were higher than at the time of the previous survey.

3. Febrile patients Curran Lutheran Hospital

Between October 26 and December 23, 1979, 41 sera were obtained from 36 febrile patients and seven from families of five of the febrile patients; four of the patients were related to one another. The specimens were tested in June 1980 by Dr. Jordi Casals at the YARU, using IFAT with antigen supplied by the USAMRIID. In six cases paired sera were submitted. Due to the limited supply of antigen not all sera were titerated to end-points, but at the 1:4 serum dilution used, Dr. Casals was able to indicate semi-quantitative differences in the antigen-antibody by reactions. The results are given in Table 3.

Seventeen percent of the patients were seropositive. One of the patients with paired sera was positive on two occasions; the first specimen was obtained on the 10th day of her illness, and the second a week later. The titer rose from 1:128 to 1:256. She was pregnant and aborted on the 23rd day of her illness.

None of the four in the familial cluster of fibrile patients was positive for LF, nor were any of the family contacts. One LF-positive patient had a highly positive Widal titer to "O" and "H" antigens, and another a gram-negative bacteremia; presumably in both instances the presence of LVA indicated previous infection, though concurrent LF could not be ruled out. One of the patients with paired sera developed jaundice, as did a person with a single specimen; neither was positive for LVA.

Clinical summaries of the seropositive patients are given in Table 4.

4. Plasma units collected during packed red blood cell preparation

At the Curran Lutheran Hospital packed red blood cell transfusions are administered commonly; the plasma separated is stored in the laboratory freezer for possible future use, and discarded after a period of time when the freezer is full. Twenty four units were found, and sera obtained from the tubing of the plasma packs. When tested by Dr. Jordi Casals at the YARU eight were found to be positive for LVA.

Conclusion:

At the end of the seond year of the program for the collection of LF immune plasma and the investigation of the epidemiology of LF in Liberia a laboratory has been established in Liberia for serological testing of specimens, and personnel employed to carry out the tests and to supervise fiedl investigations. A refrigerated centrifuge has been imported and taken to Curran Lutheran Hospital which will be the center for plasmapheresis activities. Serological surveys of hospital staffs have been continued, both to determine the annual incidence of Lassa fever, and to determine the prevalence of the disease in new areas in Montserrado and Cape Mount Counties.

Problems which have slowed the pace of the program heretofore have included the delays in completing the subcontract between Columbia University and the LIBR, some difficulties in the suppy of reagent, and the political instability in Liberia. The latter remains the only factor which may pose some questions for future progress, though at present the regime appears to be well in control of the country.

In the immediate future surveys will be carried out in various villages as a means of comparing the prevalences of Lassa fever along major routes and off them, between various tribal groups, and between various agricultural practices. The surveys will be repeated in a year to determine the incidence of LF in these communities.

Investigations of febrile patients in hospitals in Lofa County and elsewhere are being conducted as a means of determining clinical spectrum of LF

in the region, and as an assistance to the determination of its mortality and morbidity. Now that the means of testing for LF serologically are at hand, and arrangments have been set up for rapid delivery of specimens to the laboratory and the quick return of information to the hospitals, it is expected that there will be increasing cooperation of the hospitals in this aspect of the program.

Potential plasma donors have been identified, and plasmapheresis on a regular basis will be started in October. Other specimens of plasma already collected in the course of the preparation of packed red-blood-cell transfusions will be sent to USAMRIID, if desired, and will be used in the case of outbreaks of LF in Liberia, and for controlled experiments in the treatment of LF.

Because of delays in the program, extension of the research for one year without increase in costs is being sought. The objectives of the program should be attained at the end of that extension.

References

1. Frame, J.D., Baldwin, J.M., Jr., Gocke, J. and Troup, J.M. Lassa fever, a new virus disease of man from West Africa. 1. Clinical descriptions and pathological findings. Am. J. Trop. Med. Hyg. 19: 670-676, 1970.

2. Troup, J.M., White, H.A., Fom, A.L. and Carey, E.E. An outbreak of Lassa fever on the Jos Plateau, Nigeria, in January-February 1970. A preliminary report. Am. J. Trop. Med. Hyg. 19: 695-696, 1970.

3. Monath, T.P., Mertens, P.E., Patton, R., Moser, C.R., Baum, J.J., Pinneo, L., Gary, G.W., and Kissling, R.E. A hospital outbreak of Lassa fever in Zor Zor, Liberia, March-April, 1972. Am. J. Trop. Med. Hyg. 22: 773-784, 1973.

4. Fraser, D.W., Campbell, C.C., Monath, T.P., Goff, P.A. and Gregg, M.B. Lassa fever in the Eastern Province of Sierra Leone, 1970-1972. Am. J. Trop. Med. Hyg. 23: 1131-1139, 1974.

5. Frame, J.D. Surveillance of Lassa fever among missionaries stationed in West Africa. Bull. WHO 52: 593-598, 1975.

6. Monath, T.P. Lassa fever: review of epidemiology. Bull. WHO 52: 577-592, 1975.

7. Frame, J.D., Casals, J., Dennis, A. Lassa virus antibodies in hospital personnel in western Liberia. Trans. Roy. Soc. Trop. Med. 73: 219-224, 1979.

TABLES

Table 1. Serological survey of staff members at the Swedish Free Pentecostal Mission Clinic, Foya Kamara, Liberia, for Lassa virus antibodies, April, 1979. Testing by the indirect fluorescent antibody technique by Dr. Jordi Casals, Yale Arbovirus Research Unit, New Haven, and by Dr. Rinus van den Ende, Lassa Fever Control Project, Liberian Institute for Biomedical Research, Liberia. See text.

Investigator	No. Tested	Positive Titers						Total	Rate %	Non-specific or Questionable
		1:4			1:8	1:16	1:32			
		+	++	+++						
Casals	38	4	8	11				23	61	
v.d.Ende	52		2		3	7	9	21	40	5

Table 2. Serological survey of the staff of the Curran Lutheran Hospital, Zor Zor, Liberia, for Lassa virus antibodies, April, 1979. Testing by the indirect fluorescent antibody technique by Dr. Jordi Casals, Yale Arbovirus Research Unit, New Haven and Dr. Rinus van den Ende, Lassa Fever Control Project, Liberian Institute for Biomedical Research, Liberia. See text.

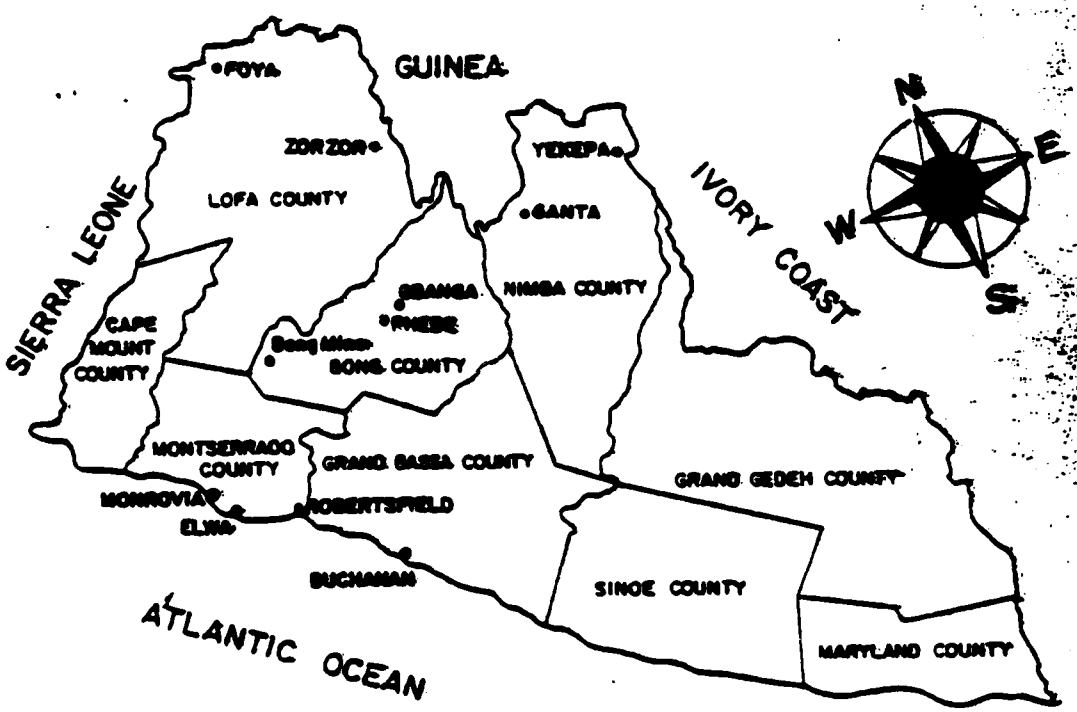
Investigator	No. Tested	Positive Titers				Total	Rate %	Non-specific or Questionable
		1:4	1:8	1:16	1:32			
Casals	87	15				15	17	4
v.d. Ende	87	3	3	2	16	24	24	18

Table 3. Serological testing of patients with fever, Curran Lutheran Hospital, Zor Zor, Liberia, October 26 to December 23, 1979. Tests performed by indirect fluorescent antibody technique by Dr. Jordi Casals at the Yale Arbovirus Research Unit, New Haven. See text.

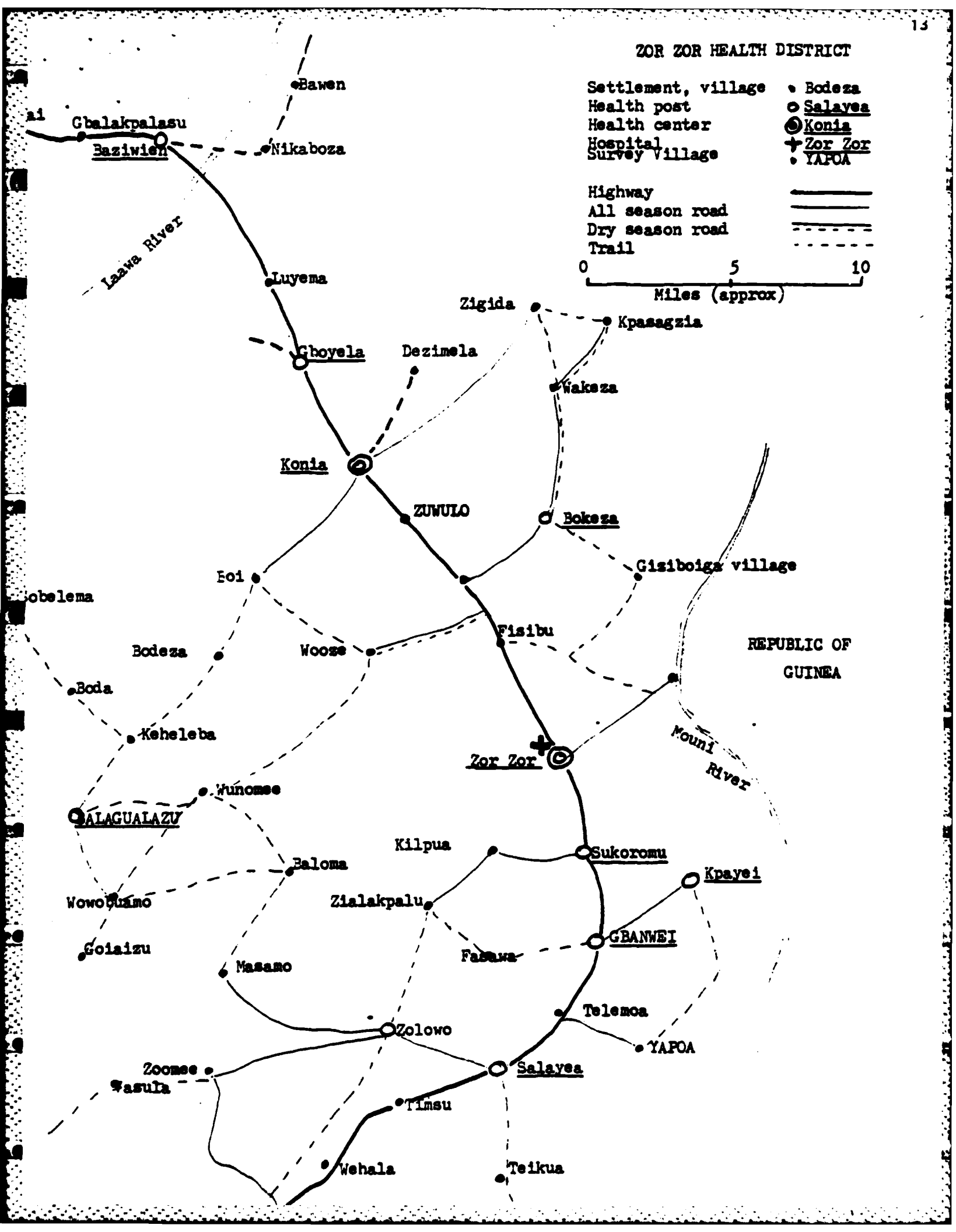
	No. Tested	No. Positive			
		Moderate	Strong	Total	Rate (%)
Patients	35	2	4	6	17
Contacts	7				

Table 4. Clinical notes regarding patients with fever positive for Lassa virus antibodies, Curran Lutheran Hospital, Zor Zor, Liberia, October 26 to December 23, 1979.

Sex	Age	Town	Occupation	Remarks
Female	30	Fisibu	Housewife	Titer rose between two tests a week apart.
Female	Adult	Zalowo		Fever, headache, vomiting. Strongly positive at 1:4
Male	Adult	Socrumo	Police	Hemoptysis, AFB positive sputum, Moderately positive at 1:4
Female	55	Fisibu	Farming	Malaise and fever 1 week Strongly positive
Male	25	Zor Zor		Leukopenia, malaise and fever 7 days. Strongly positive at 1:4
Male	15	Yellah	Farming	Fever, chest pain 2 days Moderately positive.


GUINEA
SIERRA LEONE
IVORY COAST
ATLANTIC OCEAN
FOYA
ZORZOR
LOFA COUNTY
YEKEPA
GANTA
NIMBA COUNTY
GBANGA
FREEDOM
CAPE MOUNT COUNTY
BONG COUNTY
MONTSERRADO COUNTY
GRAND BASSA COUNTY
GRAND GEDEH COUNTY
MONROVIA
ROBERTSFIELD
ELWA
BUCHANAN
SINOE COUNTY
MARYLAND COUNTY
N
E
W
S

LIBERIA


ZOR ZOR HEALTH DISTRICT
Settlement, village
Health post
Health center
Hospital
Survey Village
Bodeza
Salayea
Konia
Zor Zor
YAPOA
Highway
All season road
Dry season road
Trail
0
5
10
Miles (approx)
Bawen
Gbalakpalasu
Baziwien
Nikaboza
Laawa River
Luyema
Zigida
Kpasagzia
Gboyela
Dezimela
Wakeza
Konia
ZUWULO
Bokeza
Boi
Gisiboiga village
obelema
Fisibu
Bodeza
Wooze
REPUBLIC OF
GUINEA
Boda
Keheleba
Mouni
River
Zor Zor
Wunomse
ALAGUALAZU
Kilpua
Sukoromu
Baloma
Kpayei
Wowoguamo
Zialakpalu
GBANWEI
Goiaizu
Fasawa
Masamo
Telemoa
Zolowo
YAPOA
Zoomse
Salayea
Timsu
Wehala
Teikua

Appendix

Comments on recent political changes in Liberia, and the Lassa Fever Immune Plasma program.

The present Liberian regime is a military government under the leaders of the coup of April 12, 1980. It governs through and with the advice of civilian technicians and experts, both within and without the bureaucracy; many of the civilians have been retained from the previous regime.

County, territory and district commissioners are also military men. There is in Liberia a somewhat parallel political structure based on the indigenous tribes; there are thus tribal, clan and town chiefs. This lower group of officials in many places are the de facto executives of the central authority.

At least in Lofa County, where the Lassa Fever Immune Plasma project is concentrating its efforts, it has been pointed out that for the town, clan and tribal chiefs to be "civilian" would lead to confusion; they would not be familiar with the military chain of command, responsibility; etc. On the other hand, direct rule by soldiers would be offensive to town and clan loyalties; "the soldiers should be in the barracks."

The solution developing in Lofa County is for the town and clan chiefs to be replaced by members of their families, perhaps sons of the former leaders, who have previously served in the Army. They would in this way be "military" persons acceptable to the military government, and would yet suit the traditional tribal organization. The local chiefs govern with the advice of town elders, an informal collection of mature people, at times including women.

Permission to conduct serological and other surveys had been obtained in January from the Commissioner of Kolahun District, a man who has since been replaced, and from Chief Kumb Taylor, a clan chief of the Kissi tribe at Shello. He, too, has been replaced in the grounds of misuse of development funds. As a result, plans for village surveys in Shello will have to be renegotiated.

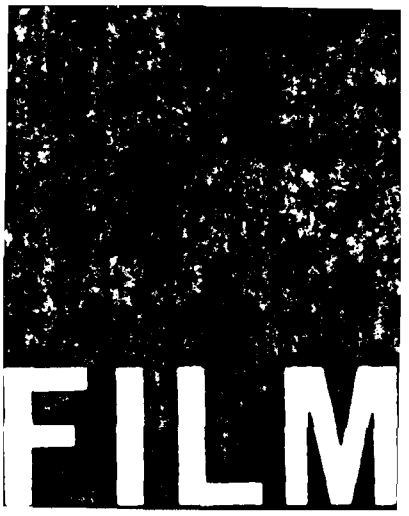
In Zor Zor district health matters have been almost completely delegated to the Community Health Program of the Curran Lutheran Hospital. After consultation with Mr. Joseph Moore and Mr. Borkai Kamara of Community Health Program we had previously decided to survey the village of Gbanwei, a Kpelle tribe village on the main highway, and Balagualezu, a Loma tribal village " in the bush." In view of the questions regarding the future of the work at Shello, we have decided to add in the Zor Zor district Yapoa, a Kpelle village "in the bush", and Zuluwo, a Loma village on the main highway. Each village has about 90 to 100 households, a population of 500 to 600. Negotiations to work at Gbanwei were repeated with the clan chief, George Nessie, a former army sergeant, and the son of the previous

clan chief. He discussed the survey with the village elders and the town clerk. The elders recommended that all members of the village be instructed to stay in their homes on the day of the survey, rather than go to their fields, that they might be available to the survey team. The date of the survey was set, and it will be carried out by the Field Investigator and the Community Health Program personnel of the Curran Hospital. These workers will then continue to the other villages in the Zor Zor district.

So far we have been successful in rebuilding our contacts under the new regime, and are reasonably certain they will be extended in the near future. We have the support of the Minister of Health, Dr. Kate Bryant, who has been carried over from the previous regime and who apparently has the complete confidence of the military government. And certainly at the local level the deep desire of the indigenous people for a solution to the control of Lassa fever has encouraged complete cooperation with whatever programs we suggest.

Distribution

4 copies	HQDA (SGRD-SI/Mrs. Madigan) Fort Detrick Frederick, MD 21701
5 copies	Commander U.S. Army Medical Research Institute of Infectious Diseases Fort Detrick Frederick, MD 21701
12 copies	Defense Documentation Center (DDC) Attn: DDC-TCA Cameron Station Alexandria, VA 22314
1 copy	Superintendent Academy of Health Sciences, US Army Attn: AHS-COM Fort Sam Houston, TX 78234
1 copy	Dean, School of Medicine Uniformed Services University of the Health Sciences Office of the Secretary of Defense 4301 Jones Bridge Road Bethesda, MD 20014
1 copy	Office of Research Management Walter Reed Army Institute of Research Walter Reed Army Medical Center Washington, DC 20012


FILM